

To: Way, Steven[way.steven@epa.gov]
From: Christner, Jan
Sent: Thur 4/24/2014 2:03:18 PM
Subject: Preliminary Load Info

Hi, Steve.

It sounded like you were interested in preliminary results from the Cement Creek loading evaluation. I've done several comparisons of loading of contaminants to Cement Creek from the different data sets, but the following seem to be what you are most interested in for looking at the potential increase in seepage into Cement Creek. Please consider this information draft as I need to confirm the calculations and thoughts expressed below. If you're interested in refining the comparison of recent (2009-11) loading with the oldest historic (1987-91) loading (neither include inflows from the American Tunnel or treated American Tunnel water), we should let someone enter the remaining CC1 data from the Sunnyside data that Allen sent. (About an hour for a junior person.)

I compared the historic Cement Creek dissolved metal (cadmium, copper, lead, zinc) loads above the American Tunnel (Location CC1 from Hydrosearch Appendix C, data from 1987-91, only a limited amount of data used) with the current Cement Creek loads (2009-11 data on the ARSG site and in other files you sent) not attributable to the 4 mines (Mogul, R&B, Gold King 7 Level, and American Tunnel). If seepage from the mine pool was contributing significant contaminant loads to Cement Creek, we would expect the contaminant loads in Cement Creek not attributable to the 4 mines to be greater than the historic loads upstream of the AT. The reverse appears to be true, as these data sets indicate that the current Cement Creek loads (downstream of the AT) not attributable to the 4 mines are less than the historic loads above the American Tunnel. Note that the current Cement Creek zinc load not attributable to the 4 mines is approaching the historic load.

The values aren't necessarily directly comparable for several reasons:

- Various remediation activities have occurred upstream of the American Tunnel between 1987-91 and 2009-11 that may have impacted Cement Creek water quality and contaminant loads.
- Only a limited number of data points were used to calculate the historic Cement Creek loads (sorry, manual data entry and you suggested only looking at a few values). This could be fixed with about 1 hour of work by a junior staff person.
- The historic Cement Creek loads were calculated upstream of the American Tunnel

and the current loads were calculated downstream of the American Tunnel. This should not be a major complication and may even be a benefit because both the old and new loading values do not include the AT discharge, either treated or not.

- This comparison assumes that no mine discharges occurred upstream of the American Tunnel prior to the bulkhead installation. If some of the historic (1987-91) loading in Cement Creek was from mine discharges, the historic loads from seeps and other sources would decrease and thus increase the percentages shown below.
- Using the average loads for all of the data, for average peak flow (May – July) and lower flow (rest of the year) may not provide the best comparisons. We're dealing with different time periods, water years, # points representative of each condition per year, etc.

Current (2009-11) load in Cement Creek not attributed to mine discharge as a percentage of historic (1987-91) load in Cement Creek above American Tunnel

| Dissolved Cadmium | Dissolved Copper | Dissolved Lead | Dissolved Zinc | | |
|--------------------|------------------|----------------|----------------|-----|--|
| Average | 49% | 32% | 36% | 82% | |
| Average May-July | 46% | 32% | 36% | 87% | |
| Average Lower Flow | 33% | 16% | 18% | 39% | |

I also compared CC18 data from before (1991-99) and after (2009-11) the American Tunnel bulkhead installation. Since we don't have exact dates for the bulkhead, the second bulkhead went in in 2001, and the mine pool didn't likely fill for several years after the bulkhead was installed, I used 1991-1999 data to indicate pre-bulkhead conditions. The following table shows the average current (2009-11) loads divided by the average 1991-99 loads. Values greater than 100% indicate that the current load in Cement Creek is greater than the historic load. A complicating factor for this analysis is that some or all of the 1991-99 data includes contribution of contaminants from the former American Tunnel Water Treatment Plant. This would increase the load at CC18 [the concentrations may be lower at CC18 if the water is treated to concentrations lower than in Cement Creek above the treatment plant, but the flows would be higher and obviously there would be some input of metals], so the percentages shown in the following table would be lower than would be expected if the treated WTP water was not accounted for in the pre-bulkhead loads.

Current (2009-11) Load in Cement Creek not Attributed to 4 Mines as a percentage of Historic (1991-99) Load in Cement Creek below American Tunnel

| Dissolved | Dissolved | Dissolved | Dissolved |
|-----------|-----------|-----------|-----------|
|-----------|-----------|-----------|-----------|

| Cadmium | Copper | Lead | Zinc | | |
|--------------------|--------|------|------|-----|------|
| Average | | 121% | 48% | 92% | 116% |
| Average May-July | | 80% | 29% | 67% | 73% |
| Average Lower Flow | | 93% | 37% | 49% | 83% |

These data appear to indicate an increase in cadmium and zinc loading to Cement Creek after bulkhead installation as compared to loading before installation of the bulkhead.

Another complicating factor for both of the above analyses is that any attenuation of contaminants or increase from mine water flowing over mine waste piles that might occur between the mine discharge and CC18 is not considered.

I did a few other comparisons, including comparison of the WTP influent (1987-91) loads with the current mine discharge loads, but there wasn't enough time to write them up. And all of these numbers need to be confirmed after walking away from the spreadsheet for awhile. The seasonal comparisons in the second set looks a little funny to me but my current checks don't find an obvious problem.

Let me know if you have questions or want me to look at anything in particular immediately. Otherwise I'll finish this early next week. I'm driving to Colo. Springs Thursday and will have a bit of time in the evening if you need something sooner rather than later.

Jan

Jan Christner

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